AD-A080 438 WOODS HOLE OCEANOGRAPHIC INSTITUTION MASS F/G 8/12
RESEARCH IN RELATIONS BETWEEN THE NORTH ATLANTIC SEA ICE AND AR--ETC(U)
MAR 80 N6ONR-277(05)
UNCLASSIFIED WHOI-REF-80-14 NL

END
DATE FILMED
3-80
DTIC

WOODS HOLE OCEANOGRAPHIC INSTITUTION

Woods Hole, Massachusetts

(14) WHOI-REF-50-14

Reference No. 50-14

(6) Research in Relations between the North Atlantic Sea Ice and Arctic Weather

conducted during the period November 15, 1949 to February 15, 1950.

(9) Periodic Status Report (15)

Submitted to the Office of Naval Research
Under Contract No. N6onr-277(03)
Task Order No. V

(11) March 1950

(12) 7

APPROVED FOR DISTRIBUTION C. O'D. Iselin
Director

381000

15

According to the terms of Contract N6onr-277, Task Order No. V, the work to be performed by the Contractor shall consist of the following:

1. Select monthly and seasonal ice data beginning approximately with this century, prepared by the Danish Meteorological Institute and the International Ice Patrol, and which were treated for individual regions in a recent investigation by L. Koch (9, Koch, 1945).

2. From the available historical series of the mean monthly northern hemisphere sea-level and regional upper-air pressure charts, and also from the seasonal charts which are to be prepared, compute zonal, meridianal, and other significant indices of the large-scale atmospheric circulation contemporary with and preceding various ice conditions in the several regions investigated.

3. Prepare mean monthly and seasonal series of North Atlantic sea temperatures from data collected by the International Council for the Exploration of the Sea and the Hydrographic Office of the United States and British Navies.

4. Compute mean monthly and seasonal series of water transports in regions that have possible bearings on the ice conditions.

5. Obtain from the wind velocities to be derived from the mean monthly and seasonal sea-level pressure charts estimates of the water-transport in the trade and other North Atlantic areas for which no direct determinations can be had.

6. Develop methods for estimating the extent and mechanism of ice melting and young-ice formation.

7. Investigate possible relations between the critically evaluated dynamic and thermal circulation indices and contemporary and following ice conditions.

Following the plan outlined in Periodic Status Report for the period May 16 - August 15, 1949, a test of the relationships that figure in the formula derived by Smith (1931) for predicting the severity of the iceberg season south of Newfoundland, was made.

The coefficients of correlation of the Bergen to Skykkisholm and Belle Isle to Ivigtut pressure falls, which form the core of Smith's formula, were recomputed to include all available data through 1948-1949, thus providing twenty-three years in addition to the series employed by him which ended with 1925-1926, or sixty-seven years of information in all.

The obtained values of, r, (Table 1 below) indicate that while the relation of the ice with the Belle Isle-Ivigtut pressure fall has remained virtually unchanged from the first to the second half of the period, its relation with the Bergen to Stykkisholm pressure fall has practically ceased to exist in recent years.

Table 1

Relation of Iceberg Count off Newfoundland to the Preceding Pressure Differences: Bergen to Stykkisholm and Belle Isle to Ivigtut, Shown by the Correlation Coefficient, r, for the Period 1879/80-1948/9 and 1882/3-1848/9, Respectively.

With Bergen - Stykkisholm Pressure Difference			With Belle Isle - Ivigtut Pressure Difference		
Period	n	Oct.-Jan. r	Period	n	Dec.-Mar. r
1879/80-1948/9	70	0.30	1882/3-1948/9	67	0.53
1879/80-1913/4	35	0.47	1882/3-1915/6	33	0.44
1914/5-1948/9	36	0.07	1916/7-1948/9	34	0.58

It was indicated in the preceding Periodic Status Report, for the period August 15 - November 15, that the North Atlantic temperature factors derived by Groissmayr continue in the aggregate to reflect the control of the following ice off Newfoundland, originally suggested by him. Accordingly, the temperature of St. John's, Bermuda and Upsala were combined with the pressure fall: Belle Isle-Ivigtut, in a formula (below) with the aid of which the departures in the ice for the period 1927-1949 were computed. The values of the deviations obtained are shown alongside the observed in Table 2.

Ice (Nfdld) = 0.13 Δ Pres. (Belle Isle-Ivigtut) - 0.27 Δ Temp. (St. John's) + 0.25 Δ Temp. (Bermuda) + 0.17 Δ Temp. (Upsala)

It appears from Table 2 that there is marked agreement on the whole between the observed and the computed departures, as shown by the correlation coefficient, $r = 0.69$ (1927-1949). For the eleven cases out of twenty-three in all, when the computed departure (indicated by Table 2 by an asterisk) exceeded $\pm$ 1.0, the agreement as to sign held in 10.

Table 2

Computed and Observed Departures (Δ) from the Long-Term Normal (1880-1926) in the Iceberg Severity off Newfoundland: 1927 - 1949, on Scale of 10.

Year	Computed Δ	Observed Δ
1927	0.1	0.0
8	0.2	0.8
9	-0.2	4.2
1930	2.1*	0.6
1	-1.8*	-2.8
2	0.4	0.8
3	0.1	-1.1
4	1.5*	1.0
5	0.7	2.7
6	-2.0*	-2.8
7	0.6	0.6
8	1.1*	1.8
9	1.1*	1.8
1940	-2.8*	-4.7
1	-1.7*	-4.7
2	-2.4*	-2.4
3	1.2*	2.4
4	-0.2	2.0
5	-0.7	3.9
6	-0.3	0.1
7	-0.7	-2.0
8	0.8	1.1
9	1.0*	-2.1

*° Based on incomplete data.

A more complete account of this investigation, together with a general discussion of the problem of iceberg foreshadowing off Newfoundland, is given in the technical report WHOI Reference No. 50-15, "Further on Foreshadowing the Iceberg Severity off Newfoundland", submitted March 1950.